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NARCISSUS ORIENTALIS.

By Louis Robechek, Ph.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 126.

Natural order Amaryllidaceæ. Habitat, Eastern Asia.

This winter blooming plant, popularly known as the "Chinese Lily" or "Flower of the Gods," has apparently been introduced by the Chinese, and is much sought after as a house plant from November to March.

It flourishes best when planted in a dish of pebbles with water just reaching the roots. Under these conditions it will bloom in about twenty-five days. If planted in half sand and half pebbles it is said to require about ten days longer. The only advantage derived from this latter method is that the seeds will then mature.

A few years ago these bulbs could only be obtained in Chinese stores, at a somewhat extravagant price, varying from fifty cents to one dollar each. Now they can be had of every seedsman at less than that price per dozen, or at from five to ten cents each.

A partial examination of the moist drug gave 52 per cent. of moisture, 3 per cent. of ash, 9·5 per cent. of mucilage, 3 per cent. of sugar and small quantities of resin, pectin, alkaloid and glucoside. There remained about 7 per cent. of lignin and 16·6 per cent. of cellulose.

The glucoside was separated from the bulb by extracting with alcohol, recovering the latter by distillation, dissolving the residue in acidulated water, and agitating the filtered solution with a mixture of ether and chloroform. On evaporation of this mixture, the

glucoside was left in a crystalline condition. When it was dissolved in water and heated with Fehling's solution, the latter was reduced. Sulphuric acid colored it reddish-brown, nitric acid turned it yellow.

Several hundred grams of the bulbs were extracted and the proportion of the glucoside found to be about two-tenths per cent.

The alkaloid was prepared by using the acid solution, from which the glucoside had been extracted by agitation with ether and chloroform. This acid solution was rendered alkaline with sodium hydrate and then agitated with chloroform. On evaporation of the latter, the alkaloid was deposited in colorless acicular crystals. These crystals, when heated on a platinum foil, melted to a bright red liquid, and then completely volatilized. When heated, with soda lime the odor of ammonia was given off. Concentrated sulphuric acid colored the crystals dark brown. An acid solution of the alkaloid gave precipitates with most of the alkaloidal reagents.

About two one-hundredths per cent. of the alkaloid were found in the moist bulbs. The dry drug yielded proportionately a much smaller quantity of the active principles, no doubt because of their decomposition from the heat employed.

These principles were also prepared by extracting the moist bulbs with acidulated water, and agitating this liquid with ether and chloroform as in the preceding case, but the mucilage present rendered the successful agitation with solvents almost impossible on account of the formation of an emulsion, which required a long time to separate.

HYDRASTIS CANADENSIS.[1]

By F. A. Thompson, Detroit, Mich.

Golden Seal, introduced to the medical profession about forty years ago by the Eclectics, has become one of the leading drugs of the Materia Medica, and for a complete Botanical, Medical and Pharmaceutical history, consult Drugs and Medicines of North America. It is my intention with this paper not to discuss the various constituents of this drug as to their characteristic reactions, or make a special study of them, but to present briefly the results obtained in assaying the drug, ground ready for manufacture of galenical preparations, and several fluid extracts made by the leading manufacturing pharmacists.

[1] Read before Michigan State Pharm. Ass'n, St. Clair Flats, June, 1893.

Golden Seal contains three alkaloids, namely, berberine, $C_{20}H_{17}NO_4$; hydrastine, $C_{21}H_{21}NO_6$, and canadine, $C_{21}H_{21}NO_4$, the latter having been in dispute for some time, and its presence but recently established by F. Wilhelm and E. Schmidt. Canadine is present, however, in but small quantities and, therefore, may be ignored in the estimation of berberine and hydrastine. The most important constituent of this drug is its *hydrastine* based on the medical reports, and it is this on which we are to judge of the quality of the drug or any preparation made from it.

ASSAY OF THE DRUG.

Ten grams of the drug in a moderately fine powder is exhausted with strong alcohol by hot re-percolation, requiring 2 or 3 hours, percolate cooled and diluted to 100 cc. with same menstruum, 25 cc. of this tincture is placed in a suitable flask, 1·3 cc. HCl, U. S. P., 0·2 cc. H_2SO_4, and 12·5 cc. concentrated ether added and the mixture allowed to stand 24 hours in a cool place, with frequent shaking. At the end of this time transfer the crystals to counterpoised filter papers, washing them with a mixture of equal volume of concentrated ether and strong alcohol until filtrate gives no acid reaction. Dry crystals at 105° C., weigh, and multiply weight by 0·9017 to obtain the amount of berberine alkaloid, and then multiply this result by 40 to ascertain the percentage.

The filtrate from berberine estimation is rendered nearly neutral, evaporated to a small volume, solution cooled and transferred to a separator and the residue remaining in evaporating dish is thoroughly washed with slightly acidulated water till, free from alkaloid, the washings added to the separator. Render fluid alkaline with ammonia water and extract the alkaloid with several portions of chloroform, evaporating the chloroformic solution to dryness at a low heat, protected from light. Redissolve in acid water, transfer to 2 oz. prescription vial, wash with ether, rejecting the same. Reprecipitate alkaloid with ammonia water and extract with several portions of ether. Evaporate the ethereal solutions in a shallow crystallizing dish. Now dissolve the residue in 10 cc. $\frac{n}{20}$ H_2SO_4 (a small amount of ether facilitates the solution of the alkaloids) add 20 or 30 cc. water, 2 drops of cochineal tincture 1 : 10 and determine the free acid by titration with N–100 sodium hydrate solution. Each cc. of N–100 H_2SO_4 neutralized

by the alkaloid represents 0·00383 gram hydrastine and this amount multiplied by 40 equals the percentage in the drug. In all my results here, I have worked duplicate assays and have also tried several duplicate assays for the hydrastine by the following modifications which have given equal results, and being much shorter, feel confident that it will prove the better method of the two. It is as follows:

After neutralizing filtrate from berberine estimation and reducing to a small volume, it is mixed with 8 or 10 grams of sawdust (formerly treated with acid water and alcohol to remove extractive matter), the mixture dried, placed in a suitable 4 oz. flask or bottle and 100 cc. of modified Prollius mixture[1] added. After macerating several hours, with frequent shaking, 50 cc. of the clear ethereal fluid is transferred to a beaker, evaporated to dryness at a low temperature, redissolved in acid water and ether, and transferred to a 2 oz. prescription vial and, from this step on, treated the same as in the other process.

EXAMINATION OF GROUND DRUG.

NUMBER.	Per cent. berberine calculated from dried (105° C.) berb. muriate.	Per cent. Hydrastine by weight.	Per cent. hydrastine by titration with N-100 H_2SO_4.
1,	3·3	2·0	1·76
2,	4·15	2·8	2·50
3,	3·13	2·52	2·3
4,	3·24	2·32	2·1
5,	3·48	2·7	2·5
6,	3·89	2·48	2·25
7,	4·06	2 8	2·5
8,	3·0	2·3	2·18
9,	3·1	2·3	2.16
Average,	3·48	2·47	2·27

The above results are much higher in the berberine and hydrastine than any recorded. Lloyd reports in Drugs and Medicines of

[1] | | cc. |
|---|---|
| Ether, | 250 |
| Chloroform, | 100 |
| Alcohol, | 25 |
| Conc. Ammonia, | 10 |

North America, a practical manufacturing yield of 1·8 per cent. mono-sulphate of berberine, equivalent to 1·39 per cent. berberine alkaloid, and hydrastine crystals from 0·25 to 1 per cent. A yield of 3 to 3·5 berberine muriate can be readily obtained on a practical scale, also a much larger amount of hydrastine, having obtained 3·6 grams of beautiful white crystals from 200 grams of drug or 1·8 per cent.

FLUID EXTRACT GOLDEN SEAL U. S. P. AND WITHOUT ALCOHOL.

Assay.—10 cc. of either preparation is placed in a 100 cc. graduated flask, about 75 cc. of alcohol is added and the mixture digested on a water-bath for 20 or 30 minutes. After cooling, sufficient alcohol is added to dilute to 100 cc. This alcoholic solution is then treated the same as the tincture obtained in the assay of the drug.

EXAMINATION OF FLUID EXTRACT GOLDEN SEAL, U. S. P.

NUMBER.	Per cent. berb. calcu. from dried (105° C.) berb. muriate.	Hydrastine by weight.	Hydrastine by titration with N-100H_2SO_4.
1, ...	2·13	2·2	1·96
2, ...	2·7	—	2·5
3, ...	1·88	1·36	1·22
4, ...	2·52	1·98	1·87
5, ...	2·52	—	2·45
6, ...	1·73	1·3	1·16
7, ...	1·89	1·74	1·62
Average, ...	2·20	1·71	1·82

The above fluids represent the leading manufactures. Van Ledden Hulsebosch, Amsterdam (*Pharm. Weekblad*, Mar. 21, 1891), reports a yield of 3·43, 2·34 and 3·63 of berberine and 2·14 and 1·71 per cent. hydrastine (by weight) in three different lots of fluid extract of his own make, and 1·86 and 2·71 per cent. berberine and 1·46 and 1·74 per cent. hydrastine, in two samples made by other pharmacists. L. van Itallie, Amsterdam (*Pharm. Weekblad*, Apr. 4, 1891), found in various fluid extracts of hydrastis, 2·21, 2·52, 1·42 and 1·79 per cent. hydrastine, by weight. The above results on hydrastine by weight would necessarily be higher than those

obtained by titration with volumetric acid solution, due to some impurity present in the alkaloid. A standard fluid extract should contain not less than 2 per cent. hydrastine, based on titration with volumetric acid.

FLUID EXTRACT GOLDEN SEAL WITHOUT ALCOHOL.

NUMBER.	Per Cent. berberine calculated from dried (105° C.) muriate.	Per Cent. hydrastine, by titration with volumetric acid.
1,	1·46	1·3
2,	2·	1·3
3,	0·65	0·61
4,	0·66	0·46
5,	0·12	0·72
6,	0·54	0·69

This preparation is used much more extensively than the Pharmacopœial extract, and therefore should be much richer in hydrastine, than shown in the above results which show up the quality of the preparation as made by leading manufacturers.

ANALYTICAL LABORATORY OF PARKE, DAVIS & CO.

June 16, 1893.

THE DETERMINATION OF HYDRASTINE IN FLUID EXTRACT OF HYDRASTIS.

BY E. G. EBERHARDT, PH.G.

Read before the Ind. P. A.

Not so very many years ago the most important constituent of Hydrastis was considered to be berberine and the valuation of the drug was assumed to be accomplished with the estimation of that alkaloid. Since then, however, hydrastine has been found to be medicinally of greater importance and at present no valuation of the drug or its preparations can be considered complete that does not include an estimation of the white alkaloid. In looking over the literature very little is found to have been done in this direction. A. B. Lyons (*American Journal of Pharmacy*, 1886, pages 583 and 586), and also H. W. Snow (*American Journal of Pharmacy*, 1888, page 494) give some data for its estimation with Mayer's solution, but no specific directions for manipulating the drug or any of its

preparations. In the *American Druggist* for 1885, page 84, is a paper by W. Simonson on the estimation of hydrastine in fifty samples of powdered hydrastis. The method employed by him consisted in expelling the alcohol from two fluidounces of tincture representing sixty grains of drug, adding water to separate oil, resin, etc., and precipitating the crude alkaloid from the filtered solution with ammonia. This precipitate he collected on a filter, washed, dried and after weighing washed with hydrochloric acid and water until nothing more was dissolved, when after again drying and weighing the difference was taken as alkaloid. The average yield from the fifty samples operated upon by him was ·125 per cent.

Having occasion to investigate a certain lot of fluid extract of golden seal the writer made a number of experiments, during which it was found that the addition of a small amount of ammonia to the fluid extract caused, after some time, the separation of hydrastine is well defined and remarkably pure crystals, but unfortunately accompanied by a dark flocculent precipitate that would on the filter accumulate into a compact mass very difficult to wash free of alkaloid. In following up this clue numerous attempts were made to avoid the precipitation of this dark substance without success. But the experiments developed a number of interesting facts.

It was found first, that, by observing proper conditions, the alkaloid could be obtained in comparatively large, acicular and nearly colorless crystals directly from the fluid extract.

Second, that the presence of ether in quantity sufficient to saturate the mother-liquor very much assists crystallization and enhances the purity of the product.

Third, that, if the fluid extract be heated before adding the precipitant, a larger yield of crystals is obtained.

Fourth, that the crystals can readily be separated from the accompanying flocculent precipitate by passing the liquid through a pellet of cotton loosely inserted in the neck of a funnel. The long needle-shaped crystals of alkaloid become entangled and are retained while the finely divided precipitate is permitted to wash through.

Fifth, that the presence of 20 to 25 per cent. by volume of officinal alcohol is necessary in order to secure good crystals, and

Sixth, that a good fluid extract of golden seal should yield from 1·5 to 2 per cent. of crystallized white alkaloid.

Without going into the tiresome details of many experiments the process finally found to give the best results was the following: Into an Erlenmeyer flask of at least 4 ounces capacity is put 25 cc. of the fluid extract. This is heated on the water-bath to a point considerably short of boiling. Ten cubic centimetres of ether are now slowly and carefully added so as not to cause loss by violent ebullition and lastly 25 cc. of a 2 per cent. ammonia solution, or a mixture of 20 cc. of water with 5 cc. of ammonia. The contents of the flask are rotated briskly for a few seconds and the whole then set aside for 12 hours, frequently rotating during the first two or three hours. After 12 hours the liquid is poured off into a funnel, into the neck of which a small plug of cotton has been loosely inserted and the whole dried and weighed. When the liquid has all passed through, the crystals remaining in the flask are carefully rinsed into the funnel and washed with distilled water until the washings pass off free of color. The funnel and contents are now dried at a temperature not exceeding 100° C., cooled in a desiccator and weighed. Subtracting from this weight the weight of funnel and cotton gives the amount of alkaloid obtained.

The fluid extract operated upon in all experiments was made with dilute alcohol and consequently after the addition of an equal volume of ammonia solution the mixture would contain approximately 25 per cent. by volume of officinal alcohol. This was found to give the most satisfactory results, all proportions having been tried from 50 per cent. down to 10 per cent. The officinal F. E. Hydrastis is made with a mixture of 3 parts of alcohol and 1 of water, which would necessitate the preliminary evaporation to 19 cc. or else the addition of 50 cc. of ammonia solution in order to reach the same proportion.

The addition of ether to a hot liquid naturally results in the loss of a large portion of it, but enough remains to saturate the liquid which is all that is required. An excess of ether causing the separation of an ether layer should be avoided.

Agitation is necessary as it facilitates the separation of alkaloid but violent shaking, especially at the time when crystallization is actively going on, must be avoided, as it results in the formation of many small crystals that are apt to pass through the cotton and be lost. The production of large crystals must be aimed at and when the process is properly conducted they can be obtained from ⅛ to ⅜ of an inch or more in length.

The crystals cannot well be collected on a filter for the impurity spoken of above, which is simultaneously precipitated, will also be retained and necessitate a second or even third crystallization. The use of cotton obviates this. A little practice, however, is necessary in preparing the funnel. If the cotton plug is inserted too tightly it will soon clog and render thorough washing impossible, if too loose alkaloid may pass through. Very naturally the cotton retains some coloring matter, but this can be ignored as it never amounts to more than a few milligrammes and does not introduce any appreciable error.

If it is desired to determine the amount of berberine also it can, by appropriate treatment, be obtained from the mother-liquor of hydrastine determination, but the order cannot with advantage be reversed, because when the fluid has once been treated with acids to precipitate berberine salts the hydrastine obtained from it is very impure and also more difficult to purify.

An alternative process of assay, which, however, requires more attention, consists in rendering 25 cc. of fluid extract alkaline with ammonia and rotating in a separator with three separate portions of ether of 15 cc. each, extracting the alkaloid from the mixed ether washings by agitating them with three portions of 10 cc. each of 2 per cent. sulphuric acid, and lastly with 5 cc. of distilled water, adding to the combined washings 10 cc. of alcohol, 3 cc. of ether and ammonia sufficient to render alkaline. After allowing to stand for six hours with frequent agitation, the crystals are collected, dried and weighed.

	Shaking Out		Precipitation.	
	Alkaloid from 25 cc.	Per cent. of alkaloid.	Alkaloid from 25 cc.	Per cent. of alkaloid.
Fluid Extract No. 22907	·447	1·788	·458	1·83
	·455	1·82	·443	1·77
	—	—	·442	1·768
	—	—	·445	1·78
	—	—	·485	1·94[1]
Fluid Extract No. 22911	—	—	·582	2·328

[1] This result was obtained after the fluid extract had stood for several days in a loosely covered vessel.

The results obtained in a limited number of determinations by both methods are given in the foregoing table.

A small amount of alkaloid is retained by the mother-liquor, for which perhaps a correction ought to be made. The quantity thus lost is proportionate to the amount of alcohol present and in a solution of the pure alkaloid under the exact conditions of the assay process amounts to ·038 gram. Whether or not this correctly represents the amount retained by the mother-liquor in the assay of the fluid extract is a point that remains to be determined before the correction can be applied. The process has not yet been adapted to the assay of the drug, the tincture, the so-called non-alcoholic fluid extract and the various fluid preparations of hydrastine.

In conclusion, I will say that this assay process could be utilized in the manufacture of the alkaloid, and considering the largeness of the yield and the ease with which it can be isolated, there seems to be no reason why it should continue to command the enormously high price that has prevailed in the past.

ANALYTICAL LABORATORY, ELI LILLY & CO.

GLEANINGS FROM THE GERMAN JOURNALS.

BY FRANK X. MOERK, PH.G.

Narceine and Aponarceine.—When commercial narceine is heated with a concentrated alkaline hydrate solution, the narceine loses a molecule of water and forms the alkali salt of a new compound called *aponarceine*: $C_{23}H_{29}NO_9 + NaOH = C_{23}H_{26}NO_8Na + 2\,H_2O$. This alkali salt in *aqueous solution* upon the addition of an acid reunites with one molecule of water and forms chemically pure *narceine* melting at 163° C.: $C_{23}H_{26}NO_8Na + HCl + H_2O = NaCl + C_{23}H_{29}NO_9$; if, however, to the *alcoholic solution* of the sodium aponarceine an alcoholic solution of an acid be added either free *aponarceine*, $C_{23}H_{27}NO_8$, melting at 157–158° C. or one of its salts like $C_{23}H_{27}NO_8\,HCl$ will be formed dependent upon the quantity of the acid added. These several preparations are intended for medicinal use and are covered by a German patent.—*Chemiker Ztg.*, 1893, 840.

Sun-flower oil, used considerably for adulterations, according to Dr. A. Jolles and E. Wild, has an iodine-absorption figure of 127 and with Becchi's test gives a more pronounced brown coloration than cotton seed oil; the test found to answer best in distinguish-

ing it from cotton seed oil is nitric acid of specific gravity 1·37, the latter oil becoming brown while sun-flower oil is not discolored.—*Chemiker Ztg.*, 1893, 879.

Picramnin, a crystallizable principle isolated by Dr. Peckolt from the fruit of *Picramnia camboita*, Engl., by extraction with petroleum ether and crystallization from alcohol, has been further studied by Dr. B. Grützner with the result that both physical and chemical properties place it among the *fats*, it being the glyceride of an unsaturated fatty acid and having the formula $C_3H_5(C_{18}H_{31}O_2)_3$.—*Chemiker Ztg.*, 1893, 879.

Soluble colloidal barium sulphate.—By mixing 120 parts of a 40 per cent. barium acetate solution with 80 parts of a 60 per cent. aluminium sulphate solution slightly acidified with acetic acid, a thick, transparent, pasty mass was obtained which only after standing for some time precipitated or changed into the usual white barium sulphate. The original mixture placed upon a filter gave a perfectly transparent filtrate which by diluting with water gave a white turbidity and separated barium sulphate; the residue in the filter after some time became white. Both of the reagents had been prepared with heat but had cooled to 15° C. before they were mixed. An explanation of this result on the ground of the solubility of barium sulphate in solutions of aluminium or barium acetates is not tenable since 200 cc. of the solution would have to dissolve about 36 grams barium sulphate.—George Buchner, *Chemiker Ztg.*, 1893, 878.

The detection of cotton seed oil in lard and olive oil by the nitrate of silver test is not trustworthy, since it has been shown that cotton seed oil by heating loses the property of turning brown with silver nitrate; F. Gautter has found the following modification of the sulphuric acid test to give reliable qualitative results: one gram of the *anhydrous* fat or oil is dissolved in 10 cc. petroleum-ether and agitated with one drop concentrated sulphuric acid. Pure lard will only give a pale straw or reddish yellow color, separating later some heavy reddish yellow globules while the supernatant liquid is colorless or faintly yellow; in the presence of cotton seed oil an immediate brown coloration is noticeable which enables the detection of *one per cent.* of the oil. Pure olive oil generally behaves like the pure lard, but may become slightly dark; in the presence of cotton seed oil,

the color is a deep or even black-brown. Arachis oil is the only other oil showing similar behavior towards sulphuric acid. For quantitative results calculation is made from the iodine absorption.—(*Ztschr. f. anal. Chem.*) *Chem. Repertorium*, 1893, 166.

Analysis of bees-wax.—The method proposed by Hübl whilst rapid and giving constant results (free acid equivalent 19–21, compound ether equivalent 73–76, saponification equivalent (the sum of the previous two) 92–97, ratio of free acid to compound ether: 3·60–3·80; the first three figures indicate the number of milligrams of KOH necessary for one gram of wax) is subject to the objection that the adulteration may be made with a mixture itself yielding the previous figures and which can therefore be added to wax in any proportion (such a mixture contains 35 parts stearic acid, 165 parts Japan wax and 300 parts ceresin-paraffin; it is possible for such a mixture to show the normal melting point and specific gravity of wax). In the analysis of wax it is therefore imperative to embody certain qualitative tests and to perform Hübl's determinations with wax melted under hot water and repeatedly washed to remove any acid which in the case of white wax especially could be introduced in the process of bleaching). The following are the qualitative tests: (1) *Stearic acid.* One gram is boiled for several minutes with 10 cc. 80 per cent. alcohol, allowed to cool to 18–20°, filtered and the filtrate diluted with water; the stearic acid separates in flakes and collects at the surface, while the liquid becomes transparent; the test is sensitive to *one per cent.;* if 7–8 per cent. are present, the acid remains suspended in the liquid forming a thick creamy mixture. (2) *Resin.* 5 gms. wax with 4–5 volumes of nitric acid sp. gr. 1·32–1·33 are kept at the boiling point for one minute, diluted with an equal volume of water and then made slightly alkaline with ammonia; the solution decanted from the separated wax in the absence of resin has a yellow color, whilst its presence causes a more or less intense red-brown color; one per cent. resin can be detected especially if a test with pure wax be made at the same time. (3) *Glycerides* (*Japan wax and tallow*) are tested for by evaporating the alcohol from the solution left after completing the Hübl's determinations, adding water, filtering, concentrating the filtrate and heating the residue with potassium bisulphate; the irritating odor of acrolein indicating glycerin and indirectly glycerides. (4) Negative results with 1, 2 and 3 and normal

figures, according to Hübl, exclude the presence of *ceresin* and *paraffin* and positively indicate a pure wax. To obtain the proper Hübl's figures in a wax adulterated with Japan wax or tallow, paraffin or ceresin would have to be added along with stearic acid or rosin; if adulterated with carnauba wax, stearic acid or resin must be added. In the analysis of white wax bleached with chemicals the acid equivalent may run as high as 24; this is the only deviation from the standard figures and is allowable, providing no stearic acid or resin is detected.—George Buchner, *Chemiker Ztg.*, 1893, 918.

Geissospermine.—From the bark of *Geissospermum Vellosii* two alkaloids were isolated by Hesse: Crystallizable *geissospermine* $C_{19}H_{24}N_2O_2 + H_2O$ and amorphous *pereirine* $C_{19}H_{24}N_2O$. Under the name of *geissospermine* a beautifully crystallizable alkaloid is isolated by Trommsdorff; it has the formula $C_{23}H_{28}N_2O_4$, melts at 189° C., and unites with one molecule of the monobasic acids. The researches of Langgaard give it physiological action simulating that of strychnine and brucine. The alkaloid is easily converted by loss of water into an amorphous base, melting at 60–70°, for which the formula $C_{46}H_{54}N_4O_7$ is calculated; this base unites with four molecules of monobasic acids to form salts, and by fusion with potassium hydrate yields a crystallizable base, melting at 151° C., which is being investigated.—M. Freund and Ch. Fauvet (*Berichte*), *Chem. Repertorium*, 1893, 177.

Gelseminine, precipitated from solutions of its pure salts, is a white, amorphous powder, which sinters at 105° C. and melts at 120°, undergoing partial decomposition. The analyses of the base and of some of its salts do not decide if its formula is $C_{24}H_{28}N_2O_4$ or $C_{22}H_{26}N_2O_3$. The hydrochlorate is crystallizable, while the sulphate, because of its solubility in water and alcohol, was only obtainable in discolored flakes by adding ether to the alcoholic solution. The best crystallizable salt is the nitrate made by carefully adding nitric acid to the alkaloid suspended in water until a clear solution results, this, by standing, deposits crystals, melting with decomposition at 188° C. Platinic and gold chlorides cause respectively yellow and brown amorphous precipitates.—L. Spiegel (*Berichte*), *Chem. Repertorium*, 1893, 177.

Alkaloidal color reactions.—The principle of the furfurol test for

alkaloids as published by E. Laves (*Am. Jour. Pharm.*, 1892, 375), has been applied to a number of alkaloids, but as will be noted the test is especially characteristic of *veratrine* and in a lesser degree also of *sabadilline*. The reagent was made by mixing 5 drops of furfurol with 10 cc. concentrated sulphuric acid; to two or three drops of this brown-colored reagent a minute quantity of the alkaloid is added and stirred with a glass rod. *Atropine*, *aconitine*, *brucine*, *colchicin*, *coniine* and *nicotine* give brown mixtures with no characteristics; *strychnine*, a dirty brown mixture, upon warming becoming dark green, the addition of a few drops of water changes it to a dirty blue or violet; *morphine* and *codeine*, a red-brown color changing to a transient violet-red upon warming; *papaverine*, brownish, later dirty violet; *digitalin*, brown, upon warming reddish; *quinine*, dark brown green, after warming green later brown, the addition of water then causes a green color especially seen at the edge; *veratrine*, yellow, olive green, the circumference blue, after a few minutes green and then a beautiful blue; *sabadilline*, like veratrine, but the colors are not so pure.—Dr. N. Wender, *Chemiker Ztg.*, 1893, 950.

For the determination of the iodine absorption of oils and fats.—P. Welmans proposes a solution which is permanent or subject only to slight variation in titer. The solution is made by dissolving without heat 25 gm. iodine and 30 gm. mercuric chloride in 500 cc. ether and making up to one litre with acetic acid. The solution titrated at once, and after two weeks showed that no deterioration had taken place; compared with the original Hübl's solution in the examination of olive oil and lard, it was found to give almost identical results, also that the presence of ether did not necessitate the use of chloroform. Concerning the time required for the complete absorption of the iodine eighteen hours' standing at 17–20° C. was found to be sufficient, while six hours was insufficient; the influence of an excess of iodine was completely exerted in the presence of an excess of 28 per cent.—*Pharm. Ztg.*, 1893, 221.

The assay of spirit of camphor is conveniently accomplished by the use of the polariscope, Dr. E. Holdermann ascertaining that a spirit containing 10 per cent. camphor examined in the 200 mm. tube showed a deviation of about 10° to the right (9·6° exactly); by diluting with dilute alcohol such a spirit to 5 per cent. cam-

phor a deviation of + 5° is noted; by diluting to 1 per cent. camphor the reading will be + 1°. Each degree of dextrogyre deviation therefore indicates *one per cent.* camphor.—*Apotheker Ztg.*, 1893, 306.

The examination of nitric acid for iodic acid is best made by adding to 10 cc. of the 30 per cent. nitric acid a few fragments of metallic tin, applying a moderate heat and allowing to stand for one minute; by agitating with chloroform the latter will take up any iodine liberated from the iodic acid. This test has preference over others in that an excess of tin will not combine with the liberated iodine.—Dr. E. Pieszczek, *Apotheker Ztg.*, 1893, 322.

Cholera, a nitrite poisoning.—Emmerich and Tsuboi, according to publications in the *Münchener med. Wochenschrift*, come to the conclusion that cholera is a nitrite poisoning, basing their conclusions upon the facts that the cholera bacillus is able to a greater extent than any other bacillus to reduce nitrates to nitrites and the internal administration of nitrites in quantity of 0·5–0·6 gm. is capable of producing very similar physiological effects in man. While other varieties of bacteria are capable of forming nitrites, none of these thrive in the intestines.—*Apotheker Ztg.*, 1893, 322.

Galbanum, as it now occurs in commerce, differs in certain respects from the galbanum of some years ago; in physical respects the consistency is more like *terebinthina*, while the odor resembles that of the so-called Levant galbanum. Towards solvents and the strong acids the greatest difference is shown, the strong acids acting upon the gum resin itself or its alcoholic solutions give only yellowish or brownish colorations instead of the violet colorations procurable according to several pharmacopœias. Petroleum-ether extracts from 23·50–30·50 per cent. resin and volatile oil after heating to 120° C. until constant weight is obtained from 3·5–4·5 per cent. resin is indicated; in previous investigations only 0·5–1·0 per cent. resin was found. This resin is soluble in sodium hydrate, and upon the addition of acid a substance called *galbanic acid* separates which later becomes crystalline. The presence of this larger percentage of resin interferes somewhat with the test for terebinthina; the petroleum-ether solution agitated with an aqueous cupric acetate with pure galbanum shows only a pale green color, whereas the pressure of 10 per cent. turpentine gives to the petroleum ether

solution an intense green color.—E. Hirschsohn, *Pharm. Ztschr. f. Russl.*, 1893, 353.

Dulcin, identical with sucrol (*Am. Journ. Pharm.*, 1893, 288) has the melting point 173–174° (not 160° C.); the solubility in water at 15° is 1 in 800, at 100° C. it is 1 in 50; in alcohol of 90 per cent. 1 in 25. Tests for purity are: (1) colorless crystals; (2) melting point; and (3) colorless solution in cold, concentrated sulphuric acid. —Dr. H. Thoms, *Pharm. Centralhalle*, 1893, 281.

The leaves of vaccinium myrtillus have attained some notoriety as a remedy for diabetes, it having been found by polariscopic examination that the administration of pills containing an extract of the leaves caused a decrease in the amount of sugar in the urine, as shown by polariscopic examination. Dr. von Oefele explains this observation, as follows: The leaves contain arbutin, which has for a long time been known to cause the urine to become lævogyre, and, therefore, the dextrogyre rotation of diabetic urine is decreased or even replaced by a lævogyre rotation. The fermentation test for sugar is also deceptive since the leaf constituents are known to restrict or even prevent fermentation of sugar and it is merely a question as to the quantity of the extract taken to entirely prevent activity in the yeast. It is interesting to note that the advocates of this remedy disregarded entirely the results obtainable with Fehling's solution, claiming that the strongly reducing effect of the urine was due to some constituents in the extract, and that the two tests, the actions of which were explained above, were only to be relied on; Dr. v. Oefele, however, states that Fehling's test reveals the true condition of the patient.— *Pharm. Centralhalle*, 1893, 306.

Hydrochloric acid containing selenious chloride as an impurity is not unfrequently met with; it has an especially destructive action upon copper vessels, acting in all probability as a carrier of chlorine, thus enabling the acid to dissolve considerable quantities of metallic copper even in the absence of any considerable amount of air or oxygen.—J. E. Gerock, *Journ. d. Pharm. v. Els. Lothr.*, 1893, 177.

An estimation of some metals and alkaloids is proposed by Professor Vitali, which in case of a metallic salt, consists in dissolving it in distilled water absolutely free from air, precipitating the metal with hydrogen sulphide and titrating the liberated acid with $\frac{n}{10}$ sodium hydrate after filtering out the metallic sulphide; from the quantity

of acid found the weight of the metal is ascertained. In the estimation of alkaloids these must be present either as hydrochlorate or as sulphate; the former salt is precipitated with silver nitrate, the latter with lead nitrate; the precipitates obtained are suspended in water, decomposed by hydrogen sulphide, and the liberated acid, corresponding to the amount of alkaloid, titrated with $\frac{n}{10}$ alkali.—(*Bollet. farmac.*), *Pharm. Post*, 1893, 297.

Benzoin constituents.—The results of an analysis of *Sumatra benzoin* concluded shortly after the appearance of the analysis by F. Lüdy (*Am. Journ. Pharm.*, 1893, 223) are briefly stated: (1) The *benzoic acid* occurring in this variety is free, while the *cinnamic acid* is combined as salts of benzoresinol and resinotannol; (2) *Styrol* is uncombined and present only in small quantity; (3) the chief constituents are the *esters of benzoresinol* and *resinotannol*, the latter being in larger quantity; (4) Sumatra benzoin is completely soluble in ether and alcohol; petroleum-ether (boiling point 40° C.), and petroleum-benzin (boiling point 65° C.) dissolve very little; benzol is only a partial solvent; (5) *vanillin* is present uncombined and exists in quantity of less than 1 per cent. *Siam benzoin* gave results as follows: (1) It is sparingly dissolved by petroleum-ether and petroleum-benzin; benzol dissolves about 90 per cent., while ether and alcohol dissolve it completely; (2) the *benzoic acid* (cinnamic acid was not found) is present in very large part, as the ester of benzoresinol and resinotannol, in small quantity it is present in the free state; (3) the chief constituents are again the benzoic *esters of benzoresinol* and *resinotannol*, the latter predominating; (4) *vanillin* is present uncombined to the extent of 1·5 per cent.; (5) benzyl-benzoate was not detected.—J. Salkind (*Dorpat Dissert.*), *Pharm. Post*, 1893, 330.

ABSTRACTS FROM THE FRENCH JOURNALS.

TRANSLATED FOR THE AMERICAN JOURNAL OF PHARMACY.

A process for the volumetric estimation of mercury based upon the reaction of a mercuric salt with protochloride of tin is published by M. J. Laborde (*Jour. de Pharm. et de Chim.*, May, 1893, p. 507). For obtaining the protochloride solution, 8 gm. of tin are dissolved in 100 cc. hot hydrochloric acid and diluted to 2 litres. Ordinary precautions must be taken to preserve it as far as possible from the

action of the atmospheric oxygen. This liquid is titrated with a solution of bichloride of mercury (10 gm. to the litre) and to counteract the retarding action of the hydrochloric acid contained in the tin solution, 0·1 gm. of the mercuric salt is treated with 5 cc. of a liquid containing 100 gm. ammonium acetate and 100 gm. acetic acid per litre. The acetic acid disperses the brown color which appears when the protochloride of tin is in excess.

This dispersion takes place more slowly toward the end of the reaction, which is indicated by the entire liquid assuming a brown color upon the addition of 3 or 4 drops more of the tin solution. Upon determining by known methods the quantity of protochloride of tin which corresponds to a given weight of bichloride of mercury, it will easily be seen that the reaction takes place according to the theoretic formula:

$$SnCl + 2HgCl = SnCl_2 + Hg_2Cl.$$

This process is very convenient, rapid and precise, and can be used inversely, for estimating protochloride of tin in a solution, by the aid of a titrated solution of bichloride of mercury.

Oil of cinnamon is considered by M. Lucas-Championnière, who has for some time been using certain oils in the place of the toxic antiseptics, of disagreeable odor, as superior even to sublimate as an antiseptic. Its slight solubility in water renders it rather irritant to the skin, but this is nullified by dissolving one per cent. in retinol. It is necessary for this solution to first rectify the oil of cinnamon, the rectified product bearing the name *cinnamol.* A salve, composed of cinnamol, retinol and wax, has a good effect upon the healing of aseptic wounds.

The oils of verbena and geranium have analogous action. These oils are easily absorbed, and are eliminated by the urine.—*Rev. therap. med. chir.*, June, 1893, p. 290.

Chlorobromide of iron.—At normal temperature and under ordinary pressure a combination of bromine and anhydrous protochloride of iron is effected only after a month or more of contact. However, using a sealed tube, operating at about 100° C. and using an excess of bromine (10 cc. to about 2 gm. protochloride of iron) crystals begin to appear after 24 hours; after about five days all the protochloride of iron is transformed into a volatile, crystalline product, which excess of bromine will not again dissolve.

This product was estimated by removing the uncombined bromine in a current of dry carbonic acid, and calculating the iron as the sesquioxide; the bromine and chlorine were estimated by the method of H. Rose; that is, submitting a mixture of silver bromide and chloride to a current of dry chlorine, and calculating the bromide by loss:

Calculated. Fe_2Cl_2Br.		Found.		
Fe =	27·05	27·25	27·19	27·13
Cl =	38·65	39·09	38·69	38·80
Br =	34·30	33·61	33·98	34·03
	100·00	99·95	99·86	99·96

The crystals are green by reflected light and perfectly opaque; the system of crystallization could not be determined. They are very deliquescent, and very soluble in water; the solution in the smallest possible quantity of water is accompanied by a notable disengagement of heat. Solution in ether is a test of purity, the protochloride of iron remaining undissolved. It is also soluble in alcohol, chloroform, benzin and toluene; insoluble in carbon bisulphide. It loses some bromine at ordinary temperatures and at the temperature of the Bunsen flame, loses nearly all of it, leaving a residue of anhydrous protochloride of iron.—M. C. Lenormand, in *Jour. de Pharm. et de Chim.*, May, 1893, p. 503.

Solution of silver nitrate has been found by van der Spil (*Geneesh. tydsch. von Ned. Ind.*, through *Rev. int. de bib. med.*, June, 1893, p. 213) to become gradually less clear, if the glass of the container is of poor quality; that is, if it contains considerable alkali.

Copper sulphate solution will undergo the change from the same cause.

Reduction of silver nitrate by the action of light.—M. Roux was led to investigate this subject by the explosion of an old argentic solution, for which there seemed no cause. He introduced into a tube, a concentrated, perfectly neutral silver solution, and exposed it to the light in the presence of distilled water. After several weeks, the silver nitrate was reduced to metallic silver, a gas, giving all the reactions of oxygen, was disengaged, and the solution which had been neutral presented a slightly acid reaction—probably by the following equations:

$$2(AgNO_3) = 2Ag + N_2O_5 + O$$
$$N_2O_5 + H_2O = 2NO_3H$$

In the opinion of the author, the explosion of the solution mentioned, which was one of the many solutions for the marking of linen, based on silver nitrate, is explained by the presence of sodium carbonate and ammonia, in sufficient quantity to redissolve the precipitate of argentic carbonate, formed from the mixture of the two solutions, the solution becoming acid, and decomposing the sodium carbonate into sodium nitrate, water and carbonic anhydride. In the opinion of the author, the addition of ammonia in excess, beside the use of yellow glass containers, for such solutions is necessary for preventing such explosions.—*Jour. de Pharm. et de Chim.*, May, 1893, p. 510.

Stability of glycerite of starch.—In M. Patel's opinion this can be attained by heating the mixture at an elevated temperature a sufficient length of time to dissolve all the starch granules. M. Chapelle, while admitting the stability of the preparation by this means, says that the product has not the proper creamy consistence, and that success depends only upon the nature of the material used, while M. Muller recommends the addition of a little gum tragacanth.—*Bulletin commercial.*

Oxalic acid is prescribed as an emmenagogue by Dr. V. Poulet, in the following formula: Oxalic acid, 2 gm.; infusion of tea, 190 gm.; syrup of bitter orange peel, 75 gm. A tablespoonful to be taken every hour.—*Rev. ther. med. chir.*, July, 1893, p. 353.

Cantharidin is prepared by the following process, which is said to yield a product superior to that obtained by other processes: Macerate the pulverized cantharides in acetic ether and add a little sulphuric acid; neutralize with barium carbonate, exhaust with acetic ether and distil the solution. The residue is evaporated to dryness, treated with petroleum-ether, then with alcohol to remove resinous coloring matters and purified by repeated crystallizations. By this process Lytta vesicatoria yielded 0·3–0·45 per cent. of vesicating principle; Epicanta Gorrhami, 0·45 per cent., and Mylabris Cichorrii, 0·9–1·03 per cent.—*Jour. de Pharm. et de Chim.*, April, 1893.

Diuretin, according to Pawinski (*Gaz. lek.*, Jan., 1893, through *Nouv. Rem.*, June, 1893, p. 253), who studied its action in more than 50 cases, does not regulate the cardiac nerves like digitalis, but still regulates the pulse indirectly, in augmenting diuresis and diminish-

ing œdema; it retards the heart-beats, and increases the blood pressure, and while it is inferior to digitalis or caffeine, it has undoubted diuretic properties, the secondary effects, however, such as headache, a buzzing in the ears, somnolence (in patients of advanced age) or insomnia being less pronounced, than after the administration of caffeine. The author prescribes it in daily doses of 3–4–5 gm., preferring it in the form of a solution, the powder becoming insoluble, by reason of the precipitation of theobromine caused by its combination with the carbonic acid of the atmosphere.

Creosote is rendered soluble in water by the following formula: Creosote, 10 gm.; tincture of Quillaia saponaria, 80 gm.; distilled water 60 gm. A tablespoonful of this liquid contains one gm. of creosote, which is in actual solution, and not merely in suspension. —M. P. Carles, in *Rep. de Pharm.*, May, 1893, p. 199.

Carbolic acid has been used with good results by M. A. Strisover (*Med. Obozr., 39*, 1893, through *Nouv. Rem.*, June, 1893, p. 264), in the treatment of several cases of rectitis which would not yield to any other measures. The remedy was prescribed twice daily as a wash, prepared by adding ten drops of the acid to two glassfuls of water, as hot as it could be borne, each washing being continued from 6 to 10 minutes.

Citrate of caffeine, for hypodermic injection is used by Soucheyre (*Gaz. des Hopitaux de Toulouse*, April, 1893) in the following solution: Citrate of caffeine, 2·50 gm.; sodium benzoate, 2·50 gm., and distilled water, 10 gm.

RUBBER IN SIERRA LEONE.

By G. F. Scott Elliot.

The rubber exported from West Africa is of two kinds. One is derived from the so-called rubber vines, which appear to be all species of *Landolphia* or *Carpodinus;* the other is derived from a tree, *Ficus Vogelii*, and possibly also from other species of fig. The most important kinds in the district through which we passed, "Oro," "Djengé," "Furé," and "Genyé" (all rubber vines), were found in old forest, and the amount existing at present cannot be large. The natives have long since cleared the land of the original primeval forest in all the parts below 1,000 feet, and the country is either under cultivation for cassada or is covered by grass or bush

from three to ten or twelve years old. The natives seem in most districts usually to make a fresh clearing after the bush has attained this age, and consequently these kinds of rubber do not get a chance of growing, as they all, so far as I have seen personally, prefer old forest where the trees are at least twenty years old, and the soil consists of a rich, moist humus, or is, at any rate, a mixture of leaf mould and other soils. On the other hand, on the plateaux of iron pan and gneiss from 1,000 feet upwards to 3,000 feet, the trees, though numerous and in large part of considerable age, are too isolated, and the soil is too dry and hard for these rubbers. In fact, the amount of rubber available from the rubber vines depends on the amount of original forest, and this is not large in the district we traversed.

On the other hand, there are enormous areas from which rubber could be obtained, provided the district was freed from the never ceasing native wars and slave-raiding expeditions. Thus the country about Laya and Kofiu Mountain, as well as the Benna country along the edge of which we passed, is full of forests and contains much rubber which would, if the roads to Kambia were safe, pass down the Scarcies River. The Fula country, lying back from the north-west corner of the English sphere of influence, is also said to be full of rubber, which would most probably come down the same way. Along the tenth degree of north latitude the country is in many places broken and mountainous, and the deeper and narrower valleys are full of dense forest, from which the rubber could be profitably withdrawn. There is also in all probability an enormous supply in the almost uninhabited Koronko district, and in the magnificent woody valleys about Bafodeya and other parts of the Limba country, on the Upper Rokelle and especially in the back country of Sherboro. I should think it probable that with roads made absolutely safe, the supply of rubber from the colony might be doubled, or even quadrupled in amount, but with the development of lawlessness, and the constant native wars everywhere, but little is to be expected after the next few years, when the sources readily reached from the coast have been drained of their supplies. It must also be remembered that the supply is one which is likely to be exhausted with increase of population and ought not to be reckoned upon for more than a few years, supposing the country were rendered safe.

This, however, only applies to the above-mentioned kinds, and does not affect the supply derived from *Landolphia florida*, and the other species of *Carpodinus*. These latter plants were found in fairly open dry ground, at from 1,000 to 3,500 feet, and are probably very abundant everywhere. The rubber yielded by them is neither so good nor so abundant as that from the above-mentioned kinds, though probably it could be immensely improved by better means of extraction. With regard to the rubber from trees, I only found *Ficus Vogelii* once in the Niger drainage area; this is the kind found at Bassa and lower down the coast. There are about thirty-nine specimens of *Ficus* sorts in my collection, and it is of course possible that several of these yield rubber, but the only other species of which I heard this is a new species. On the whole, the supply existing in the country we traversed cannot be considered as of great importance.—*Colonial Report;* from *Pharm. Jour. and Trans.*, July, 1893, p. 25.

REPORT OF TWO SAMPLES OF "IPECACUANHA."[1]

By Professor John Attfield, Ph.D., F.R.S.

(1) Each sample was duly sealed in red wax, impressed "London and India Docks Joint Committee."

(2) One sample was labelled as follows:—"London and India Docks Joint Committee. Ex *Tamar* and Rail. 93/447. J. F. M. No. 2. 1 Bale. 2 lbs. sample Ipecacuanha. Crutched Friars Warehouse. 29·5·'93."

(3) The other sample was thus labelled:—"London and India Docks Joint Committee. Ex *Tagus* and Rail. 93/333. DV L. No. 59. 1 Bale. 2 lbs. sample Ipecacuanha. Crutched Friars Warehouse. 29·5·'93."

The "No. 2" Sample.

(4) I find this to consist of 65·7 per cent. of official ipecacuanha, and 34·3 per cent. of ipecacuanha stems.

(5) The 65·7 parts of official ipecacuanha contain 1·327 parts of the alkaloidal substance known as emetine.

(6) The 34·3 parts of ipecacuanha stems contain 0·648 parts of similar emetine.

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[1] *Pharm. Jour. and Trans.*, July 15, 1893, p. 48.

(7) Therefore, 100 parts of this No. 2 sample of so-called ipecacuanha yield 1·975 parts of emetine; for 1·327 plus 0·648 equal 1·975.

(8) Further, a direct determination of the alkaloid in this No. 2 sample gave me 1·950 per cent. of emetine.

(9) The figures in paragraph 5 show that the official ipecacuanha in this No. 2 sample contains 2·020 per cent. of emetine.

(10) The figures in paragraph 6 show that the ipecacuanha stems in this No. 2 sample contain 1·890 per cent. of emetine.

(11) The moisture in the official ipecacuanha of the sample amounts to 9·9 per cent.; the moisture in the stems to 8·1 per cent.; in the whole sample, 9·3 per cent.

The "No. 59" Sample.

(13) I find this to consist of 62·6 per cent. of official ipecacuanha and 34·4 per cent. of ipecacuanha stems.

(14) The 62·6 parts of official ipecacuanha contain 1·252 parts of the alkaloidal substance known as emetine.

(15) The 34·4 parts of ipecacuanha stems contain 0·546 parts of similar emetine.

(16) Therefore, 100 parts of this No. 59 sample of so-called ipecacuanha yield 1·798 parts of emetine; for 1·252 plus 0·546 equal 1·798.

(17) Further, a direct determination of the alkaloid in this No. 59 sample gave me 1·820 per cent. of emetine.

(18) The figures in paragraph 14 show that the official ipecacuanha in this No. 59 sample contains 2·000 per cent. of emetine.

(19) The figures in paragraph 15 show that the ipecacuanha stems in this No. 59 sample contain 1·46 per cent. of emetine.

(20) The moisture in the official ipecacuanha of the sample is practically 10 per cent.; in the stems 8 per cent.; in the whole sample, 9·3 per cent.

Remarks.

(21) These two samples of so-called ipecacuanha contain, in round figures, two-thirds only of official ipecacuanha and one-third of ipecacuanha stems.

(22) By official ipecacuanha I mean that which alone is recognized by the compilers of the British Pharmacopœia, and, therefore, that which can alone be used legally, under the Medical Acts in the official "Preparations" of ipecacuanha, namely, true *roots*.

(23) Ipecacuanha *stems* have no official value, indeed, they have no official position.

(24) The 2 per cent. of emetine I find present in the official ipecacuanha of these two samples of so-called ipecacuanha is somewhat above the average proportion of emetine present in official ipecacuanha; for though still higher proportions have been recorded, a large number of lower proportions have been published; my own analyses of other samples also point to at most 1¾ rather than 2 per cent.

(25) But, in truth, nature knows no "average" proportion of alkaloid in drugs; differences in soil and climate in different places, or in the same place in different years, causing great variations. Secondly, while such an alkaloid as, say quinine or morphine, has at least fixed and definite properties, the so-called "emetine" has not yet been obtained in a sufficiently fixed and definite condition to enable us to say that it is one single substance, emetine, and nothing else; hence, analysts at present have to rely on the general alkaloidal characters of the article termed "emetine" which they extract from ipecacuanha. Thirdly, the acids and alkalies that are used by analysts attack "emetine," therefore the yield of "emetine" will only be constant when the conditions of manipulation are constant.

(26) A conventional process for the assay of ipecacuanha, described with great detail and under well-recognized authority, will doubtless be forthcoming in due time if no more scientific process should be discovered. Meanwhile, if analysts were to extract with cold ammoniacal chloroform first, and hot afterwards, and conduct any evaporation at as low a temperature as possible, maximum and fairly concordant results as regards any one sample analyzed by different analysts might be expected.

(27) It is to be hoped that any future authoritatively enjoined "standardization" of ipecacuanha founded on proportion of emetine will be therapeutically satisfactory, but such a position is not yet attained. Indeed, it would seem that ipecacuanha root from which all "emetine" is removed still has pharmacological value. The latter may or may not run parallel with percentage of "emetine." Meanwhile, our only guide is "emetine" estimated with all attainable accuracy.

(28) We may be said to know nothing, and to be able to infer but

little pharmacologically, respecting ipecacuanha *stems*. Even the estimations of "emetine" in ipecacuanha stems are too few at present to warrant generalization as to the relative proportion of "emetine" in stems as against "emetine" in root.

(29) I regret that the present state of knowledge regarding the pharmacology of ipecacuanha and its alkaloid or alkaloids or other active principles, either on the chemical or medical side of pharmacology, prevents me writing any more definite report than the foregoing. And I fear that little more can be said on the subject until the drug and its contents have been submitted to thorough original research by some agency commanding commensurate knowledge, funds, and general resources.

CHLORALOSE, A DERIVATIVE OF CHLORAL, AND ITS PHYSIOLOGICAL PROPERTIES.[1]

By Hanriot and C. Richet.

Equal quantities of anhydrous chloral and dry glucose are heated together at 100° for an hour, and the cooled product is mixed with a small quantity of water and extracted with boiling ether. The portion soluble in ether is distilled repeatedly with water until all chloral is expelled, and the aqueous solution is then subjected to fractional crystallization; in this way, the anhydroglucochloral which has already been described by Heffter (Abstr., 1889, 845), and which the authors propose to call *chloralose*, is obtained in two forms, namely, chloralose, which crystallizes in slender needles melting at 184–186°, and volatilizing without decomposition, and *parachloralose*, which crystallizes in nacreous lamellæ melting at 229°. The latter is soluble with difficulty even in hot water. Both substances have the composition $C_8H_{11}Cl_3O_6$.

Chloralose with sulphuric acid yields a disulphonic derivative, and with acetic anhydride a tetracetyl derivative. Contrary to the statement of Heffter, it does not yield glucose when treated with potassium hydroxide.

Parachloralose, probably by reason of its insolubility, is without physiological activity, but chloralose, when administered by ingestion, produces hypnotic effects, and at the same time increases the excitability of the spinal marrow. When given to dogs in the

[1] *Comp. Rend.*, **116**, 63–65; Jour. Chem. Soc., Abst. I, p. 247.

proportion of 0·6 gram per kilogram of body weight, it produces only anæsthesia, and not death. The hypnotic effect begins to be evident with doses so small as 0·02 gram per kilogram of body weight, and hence, chloralose is much more active than chloral, and its effect cannot be attributed to a decomposition into chloral. When administered to human beings in doses of from 0·2 gram to 0·75 gram, but not exceeding 1 gram, it acts as a valuable hypnotic, producing no disturbance of digestion, no cephalalgia, and no phenomena of intoxication.

CAPARRAPI BALSAM.[1]

By Dr. T. Bayón.

Corresponding Member of the Pharmaceutical Society of Great Britain.

This so-called balsam derives its name from the village of Caparrapi in the province of Cudinamarca, in the United States of Columbia, where it is prepared. The plant which yields it is a large forest tree belonging to the natural order *Lauraceæ*, and is one of the loftiest members of this family. It grows at an altitude of about 1,300 metres above the level of the sea, and in a climate where the mean temperature is 21° C.

The tree has not hitherto been described by botanists, and may be characterized as follows:

Laurus giganteus.—An evergreen tree, with aromatic leaves and bark, the fruit and calyx exhaling an odor of cinnamon. The bark exfoliates in small pieces. The branches are opposite, cylindrical, and glabrous. The leaves are alternate, stalked, oval-oblong and lanceolate, coriaceous, shining on the upper surface and greenish white beneath, with only one median nerve. The flowers are small, regular, hermaphrodite, and are arranged in panicled dichotomous cymes. The receptacle is cup-shaped. The perianth is persistent; it has five segments. There are twelve stamens in four rows of three each; the two exterior rows have introrse anthers, the third row has extrorse anthers and filaments furnished with two lateral stalked glands at their base, and the fourth row consists of sterile stamens. The anthers are four-celled, with loculicidal dehiscence. The ovary is simple and one-celled, with a simple style and capitate

[1] Abstract from the original Spanish, in the Pharm. Jour. Trans., June 24, 1893, 1045.

stigma. The fruit is baccate, oval like the fruit of *Quercus Ballota.* but striated from base to apex; it remains attached to the persistent calyx and receptacle. The seed is oily, and has a burning taste like capsicum.

The balsam is obtained by making a horizontal incision into the trunk, the lower part of the incision being made concave so as to retain the balsam that drains into it. The upper part of the incision is made so as to prevent moisture entering in case of rain, and the incisions are usually made on the sunny side of the tree. The balsam has an aromatic odor; in color it varies according to the age of the tree, but usually resembles balsam of tolu, than which it is more fluid. In medicine it is used by the natives as a stimulant for catarrhal complaints, especially when of a chronic character, such as bronchitis, laryngitis, nervous catarrhal asthma, and also for chronic inflammation of the genito-urinary tract, such as catarrh of the bladder, leucorrhœa, and obstinate blenorrhagia. It is used in several preparations in the following proportions: syrup, 30 to 50 grammes; pastilles, 2 to 10 grammes; tincture, 2 to 10 grammes; electuary, 1 to 4 grammes. It is also given alone in doses of ¼ to 2 grammes, and may be administered in the form of pills, cigarettes, or fumigations. By the natives it is employed in the treatment of snake bites and the stings of poisonous animals, as the ray and scorpion, and the poisonous arachnid, known locally as the "coya." The balsam is usually applied externally, and given internally in a dose up to 30 grammes, according to the severity of the poison. In a case of poisoning by the coya, in which an insect had accidentally been crushed on the leg, and the poison absorbed, the patient lost consciousness and sensibility, and had lockjaw for sixty hours, but an external application of the balsam and a dose of 10 drops taken in 2 grammes of alcohol and 30 grammes of water served to effect a cure.

ON THE ALKALOIDS OF GELSEMIUM SEMPERVIRENS.

By Arthur R. Cushny.

(Berichte Deutsch. Chem. Gesell., 1893 p., 1725.)

The author has examined the alkaloids found in Gelsemium, retaining the names proposed by Gerrard and Thompson, namely, gelsemine, for the alkaloid yielding crystalline salts, and gelseminine for the other.

(1) *Gelsemine* is a dry, non-crystalline mass, white in color, bitter, strongly alkaline and insoluble in water. Neither nitric nor sulphuric acids give color reactions, but if an oxidizing agent, such as manganese peroxide, cerium oxide or potassium dichromate be added to a solution in the latter liquid, it assumes an intense red color which gradually becomes green. The gold and platinum double salts are soluble in hot water, and on cooling separate in a crystalline state. An analysis of the hydrochlorate showed the formula $C_{40}H_{68}N_5O_{14}.2HCl$.

(2) *Gelseminine* is amorphous, strongly alkaline, insoluble in water, but soluble in alcohol, ether and chloroform. The salts are amorphous, yellow and easily soluble in water. Sulphuric acid colors it yellow; nitric acid, green; sulphuric acid and oxidizing agents, violet gradually becoming green. The platinum double salt is amorphous and brownish yellow in color and easily soluble in water and alcohol. By liberating the alkaloid polymerization takes place. Analysis showed the formula $C_{42}H_{47}N_3O_{14}HClPtCl_4$.

H. C. C. M.

THE BOTANY AND CHEMISTRY OF ESSENTIAL OILS.[1]

By H. A. D. Jowett.

Botany.—The essential oils or products from which they are derived appear to be confined to certain orders, *Rutaceæ*, *Myrtaceæ*, *Umbelliferæ*, *Compositæ*, *Labiatæ*, *Lauraceæ*, *Coniferæ*, and others, but though confined to a relatively few natural orders, they are found in all parts of the plant, and may occur in seeds, roots, stem, leaves or flowers.

The oil is generally contained in special receptacles in the plant, which may be divided into vessels and cavities, and, indeed, they are often classified under these heads, but I prefer to treat of them as (α) of protogenetic origin, arising by the differentiation of fundamental tissue, and (β) of hysterogenetic origin, appearing in differentiated tissue.

Those of protogenetic origin, which are by far the most common, may furthermore be divided into vessels and cavities.

(1) *Vessels.*—These are generally of schizogenous origin, and occur in *Coniferæ*, *Compositæ* and *Umbelliferæ*. They are formed in

[1] Read at a meeting of the Chemists' Assistants' Association, held on Thursday, March 2, from Pharm. Journ. Trans., July 1, 1893, p. 6.

a simple way, well exemplified in Pinus. An intercellular space already existing or produced by division of a mother cell into four daughter cells becomes very much enlarged, and the cells surrounding it become modified, for by radial and tangential division they form an epithelium surrounding the vessel, and these in turn are surrounded by a tapetal or protective layer, and this often by a ring of sclerenchyma.

The epithelium secretes the oil as drops in the vessel, and the two protective layers prevent transfusion of the oil to the surrounding tissue.

The drops of oil thus formed coalesce until gradually we have the vessels filled with the essential oil. These passages generally occur in the cortical parenchyma of the plant, which is the great metabolic tissue, but they may occur either in the pith or primary xylem, as in Philodendron, whilst in the *Umbelliferæ* the passages are produced from intercellular spaces produced by the splitting of the walls of certain cells abutting on the pericycle.

(2) Cavities are generally formed lysigenously, and occur in *Rutaceæ*, *Labiatæ*, *Myrtaceæ*, and are generally produced in the following way: Two cells becoming meristematic give rise, by cell division, to a number of smaller cells, which secrete drops of oil, and by the coalescence of these drops the space formerly occupied by the cell is filled with the oil, the cell wall in the meantime having been dissolved, perhaps by an enzyme.

In *Myrta communis*, according to Frank (*Beitr.*, 125), a cell divides into eight octants, and these form an intercellular space, which, gradually becoming filled with oil, crushes the cells to the side, and they thus become flattened, form an epithelium. This is a case of schizogenous formation, but the details are doubtful, and fresh observations must be made before fully accepting this as a mode of formation of the oil cavity.

The spots in Hyperica and cells in Eucalyptus are formed thus, and it may be taken as a general rule that vessels are formed schizogenously and cavities lysigenously. We now examine the other divisions of oil receptacles, those of hysterogenetic origin.

(3) They exist both as vessels and cavities, but are not nearly so common as those I have just described. In Copaifera and Dryobalanops the oil receptacles are of enormous size, and are formed by disorganization and solution of the heart wood, and they are also

formed in the secondary bast of certain *Umbelliferæ* and *Compositæ*.

In the *Coniferæ*, when the cortical parenchyma disappears owing to secondary thickening, the resin vessels are replaced by sacs of lysigenous origin.

According to the researches of Mesnard, the oil is produced from tannoid substances (formed from the chlorophyll) in the absence of light and oxygen. Thus, in the sepal the oil is found in the cells on the upper surface, protected from light and oxygen in the bud, and the tannin and pigments in the cells of the lower surface which have been exposed to light and oxygen.

He finds that the oils are thus formed in the jasmine, rose and violet, but in the orange there are several oils, and in the *Tuberaceæ* the oil is found on the lower surface, and this abnormal result is probably due to the presence of a fixed oil and abundance of chlorophyll, for these oils are always found in the cells of palisade parenchyma, and thus result from chlorophyll.

In some cases the oil is produced by enzymes from other complex bodies, *e. g.*, Valerian, oil of bitter almonds, and possibly salicin.

Some doubt exists as to whether the oil exists as such in the vessels of the *Coniferæ*, or whether the oil is produced by the decomposition of this body.

We have thus left the question of the physiological function of these oils to the last, and the answer, it must be confessed, is more of a conjecture than statement of facts.

It is now well known that the food taken into an organism may be divided into two parts—that assimilated and used in the metabolic processes of the plant, and that which is not so used, and is thus rejected by the organism. In animals the portion not assimilated is excreted, and passes away from the organism, but in plants this is not always the case. In a few plants, as *S. Incrustata*, special apparatus exists for the excretion of material not required by the plant, but in most cases the plant disposes of the matter by secretion in certain sacs or vessels or renders them harmless by combination with other bodies, as calcium oxalate.

There is little doubt but that essential oils, resins, alkaloids, etc., fall under this category, and must be viewed as bye-products in the metabolic processes of the plant. They are not exactly degradation products, as gums, etc., but are substances produced by the plant which are of no use to it.

To summarize—the oils are found in vessels or cavities of protogenetic or hysterogenetic origin, and are produced by the protoplasm, probably as bye-products in the elaboration of the food material of the plant.

Chemistry.—The constitution of the oils is so varied that it is difficult to divide them into any well-defined groups, but for the sake of convenience we may study them in the following classes:

(α) Oils which are single chemical compounds, and whose constitution is known, as oil of bitter almonds, wintergreen, etc.

(β) Terpenes or the constituents present in most essential oils, belonging to the hydrocarbons, as pinene, limonene, etc.

(γ) Other constituents in the oil, and to which often the peculiar odor is due. These may be further subdivided into aldehydes, ketones, alkyl salts, alcohols, phenol derivatives, etc.

(α) There are not many essential oils consisting of one body, but there are a few, the chief of which are—oil of wintergreen obtained from *Gaultheria*, *Procumbens* and *Betula lenta*, essential oil of mustard, oils of rue, meadow-sweet (*Spiræa Ulmaria*) and bitter almonds. Of these the oil of wintergreen is an alkyl salt, and is 1·2 methyl salicylate, $C_6H_4 \cdot OH \cdot COOMe$. Oil of meadow-sweet belongs to the same series of bodies, but is the aldehyde of the acid of which oil of wintergreen is the methyl ester. It is salicyl aldehyde, $1 \cdot 2C_6H_4 \cdot OH \cdot CHO \cdot$. Both may be made by generic methods.

Oil of bitter almonds is, of course, benzaldehyde, and rapidly oxidizes into the acid.

These all belong to the aromatic group, but the other oils belong to the aliphatic series. Essential oil of mustard is allyl-isothiocyanate, and bears the same relation to the thiocyanate that carbamide does to a nitrile. It is prepared by a method which one would expect to yield thiocyanate, which is probably the case. By treating allylamine with CS_2 we get first the thiocyanate, which, on distillation, undergoes molecular rearrangement, forming the iso-mustard oil

$$CS_2 + NH_2 \cdot C_3H_5 = CS{:}N \cdot C_3H_5 + H_2S$$

Though really

$$CS_2 + NH_2C_3H_5 = C_3H_5S \cdot C{:}N + H_2S$$

and

$$C_3H_5S \cdot C{:}N = CS{:}NC_3H_5$$

Oil of rue is a ketone, and consists of methyl nonyl ketone, $MeC_9H_{19}CO$, but its constitution is not fully known, as it is possible for several isomers of this formula to exist, and the particular formula for C_9H_{19} has not yet been worked out.

(β) We pass on to the terpenes, with which are ever associated the name of Tilden and Wallach.

These occur in very many essential oils, particularly those of the *Coniferæ*, which consist almost wholly of terpene, but many oils—oil of lemon, thyme, fennel, etc.—contain one or more of these terpenes.

They may be represented by the formula $(C_5H_8)_n$, and are closely related to cymene.

The number of isomers is much smaller than was at first supposed, and I only propose to mention the more important of them:

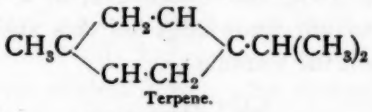
Pinene is contained in German and American oil of turpentine, oils of juniper, eucalyptus, sage, etc., and is obtained by distillation.

Limonene is found in oils of lemon and orange peel, oil of dill, oil of caraway, oil of bergamot, etc.

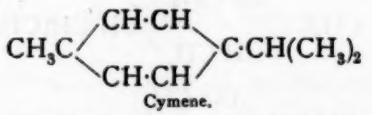
Silvestrene occurs chiefly in Swedish and Russian oil of turpentine.

Phellandrene occurs in eucalyptus oil, elemi and fennel, and is distinguished from others by forming a crystalline compound with HNO_2. These different terpenes often exist in dextro-rotatory and lævo-rotatory forms, and often by a mixture of these we may get inactive bodies. Wallach has separated them and identified them by formation of their hydrochlorides, bromides and nitrites.

They have not yet been synthesized, and their chemical constitution is not quite settled, but they are probably isomerides of dihydromethylisopropyl benzene, or dihydrocymene:



Terpene.



Cymene.

Though cymene has been prepared synthetically by Widman, from 1·4 bromcumene and MeI (*Ber.*, xix), it has not yet been found possible to hydrogenate it and produce the terpenes.[1]

[1] Since the above was in type, Baeyer claims to have synthesized dihydrocymene (*Ber.*, 26, 232).

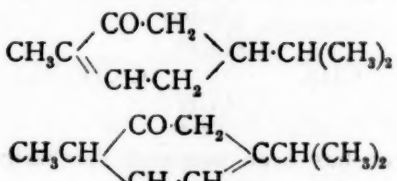
The terpenes, then, are a class of bodies of formula $(C_5H_8)_n$, of the probable composition dihydroparacymene, and exist in a number of isomeric forms which are identified by the compounds they form with bromine, hydrochloric and nitric acids.

I have treated of the terpenes in a very cursory way, but as my time is limited I must now pass on to consider the next group (γ), the members of which are generally the aromatic constituents of the oil. Of late, much light has been thrown on these constituents, but much remains to be done; but here, as in the terpenes, it is probable the number of substances present is actually less than was at first supposed. Since the camphors as a class are very much allied to the terpenes, I shall treat those first.

They include camphor, Borneol camphor, menthol and thymol. Of these we have:

$C_{10}H_{16}O$	Camphor, thymol, carvacrol.
$C_{10}H_{18}O$, ...	Borneol camphor and cineol.
$C_{10}H_{20}O$, ...	Menthol.

The constitution of camphor is still an open question amongst chemists, and several formulæ have been proposed for it. It has not yet been synthesized from cymene, to which it certainly bears a very close relation. The facts that camphor combines readily with HCN, phenyl hydrazine, and $NaHSO_3$, and that on oxidation it yields camphoric acid, and also that by treatment with $ZnCl_2$ and other dehydrating agents we get as a chief product paracymene, tend to show that it is a ketone of which Borneol camphor is the secondary alcohol, as camphor on reduction with Na yields Borneol camphor, which, on oxidation, yields camphor. There are several objections to this view, but Cazeneuve, in a masterly review of the whole state of our knowledge on this subject (*Bull.* [3], ix, x, 38), ascribes to it the formula:



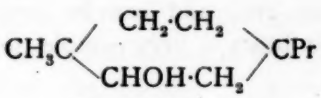
Camphor.

Thymol—one of the official stearoptens, occurs in ajowan and other oils. It is probably a tertiary alcohol, and is metahydroxy-cymene 1, 3, 4.

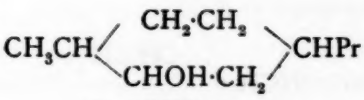
Carvacrol, readily obtained from camphor and a constituent of Spanish hop oil, is isomeric with thymol, but is the ortho-derivative.

Borneol camphor is supposed to be a secondary alcohol, and on oxidation yields camphor, but in the unsatisfactory state of our knowledge concerning camphor little reliance can be placed on this formula.

Cineol, having the same empirical composition as the above, exists in many oils, but has been disguised under different names; it is an anhydro body and is identical with eucalyptol, cajeputol, etc., and is found in the oils of wormseed and *Lavandula Spicata.*



Borneol Camphor.



Menthol.

Menthol, $C_{10}H_{20}O$—this body, so largely used in pharmacy nowadays, is a secondary alcohol, and on oxidation yields a ketone, which with sodium may be again converted into menthol.

These bodies, either ketones or secondary alcohols, bear a very close relation to the terpenes and to paracymene, but their constitution has not yet been verified by their synthetical formation, and the formula of camphor must be received with very great caution.

We have thus left a number of the aliphatic compounds and phenol derivatives of varied composition. I first propose to take a group of bodies very closely related to each other, which are found in many essential oils, but I must again remind you that our knowledge on this subject is somewhat meagre, and systematic investigation into their constituents has only been undertaken within the last few years.

Many oils are omitted on account of insufficient data from which to generalize.

The group that I shall take includes the aldehydes, alcohols, ketones and alkyl salts—all related to each other and often found in the same plant.

Of these several have the same empirical composition as the

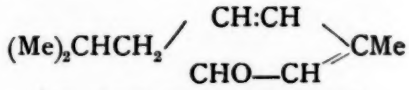
camphor group we have just discussed, but differ from them in being open chain compounds. They are:

$C_{10}H_{16}O$, ... Citral or geraniol aldehyde.
$C_{10}H_{18}O$, ... Citronellic aldehyde.
Rhodinol.
Geraniol identical with linalool, coriandrol and aurantiol.
$C_{10}H_{20}O$, ... Citronellic alcohol.

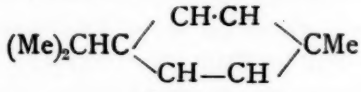
These are pretty widely distributed, and occur generally associated with terpenes in a good many oils.

Citral.—This is found in oils of orange peel, lemon, lemon grass, citronella, eucalyptus, etc., and can be prepared by oxidizing geraniol, to which it bears a very simple relation, viz: that of aldehyde to alcohol.

It is readily converted by heat into cymene, and the following formula has been assigned to it:



Isobutylethylin-β-methylacrylic aldehyde.



Cymene.

Geraniol.—The alcohol corresponding to citral occurs in a good many oils and has been given different names, but it is identical with linalool, coriandrol, and possibly aurantiol and rhodinol. It is found, to a large extent, in the Indian grass oils (92 per cent.), andropogon, lemon grass, Indian or Turkish geranium, ginger grass and vetivert, in lavender, coriander, linaloe, petit grain and bergamot.

Citronellic aldehyde exists in large quantity in oil of citronella, and is isomeric, but not identical with Borneol and geraniol. On reduction it yields citronellyl alcohol, which is also found in citronella oil, and their constitution is supposed to be β-methyl α-isobutylallylacetaldehyde—

$$\begin{matrix}CH_3\\CH_3\end{matrix}\!\!>\!CH\cdot CH_2\cdot CH{:}C\cdot Me\cdot CH_2\cdot CHO\cdot$$

with the alcohol CH_2OH replacing CHO in the formula for citral.

Rhodinol, isomeric with geraniol, is the elæoptene contained in rose oil, and may be represented by *a*-propyl *σ*-propylcrotonylene-methylcarbinol—

$$CH_2 : CPr{\cdot}CH : CH\ CHPr{\cdot}CH_2OH.$$

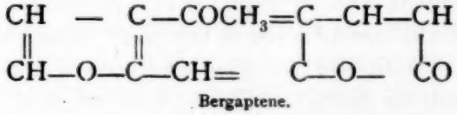
These bodies, though of same empirical composition as the camphors, differ greatly from them, but they are very closely allied to each other. They exist in plants of widely different orders, and, no doubt, further research will prove them to be contained in other oils. Closely allied with them in the oils are the alkyl salts of these alcohols—generally the acetate.

Geraniol acetate, $C_{10}H_{17}CH_3CO_2$, occurs in oils of lemon, bergamot, linaloe and lavender; and aurantiol acetate, either identical or isomeric with the above, in oil of petit grain. These we should expect to be fragrant bodies, recalling the alkyl salts of amyl and valerian, and in *A. nobilis* we have amyl and butyl tiglinates and angelicates with other alkyl salts. This I think is a fair and general account of the bodies belonging to the aliphatic series, and before passing to the phenol compounds, I shall give an example of the constituents of an oil showing how my generalization applies.

Oil of bergamot (*Citrus Bergamia*) contains:

40 per cent.	limonene	} terpenes described under that head.
10 "	dipentine	
25 "	geraniol—alcohol $C_{10}H_{18}O$.	
20 "	geraniol acetate.	
5 "	bergaptene.	

Bergaptene is a body supposed to be the lactone of bergaptenic acid, a body allied to coumarin, and would be represented thus:



Bergaptene.

We see, therefore, in this oil the terpenes, alcohol and alkyl salt, and another body in very small quantity and possibly formed from others.

I now pass on to those constituents which belong to the benzene group proper, though thymol described under camphors really comes under this category, but most of them may be regarded as derived from benzene rather than paracymene.

The most important are :

Anethol, $C_{10}H_{12}O$, which occurs in oils of fennel, aniseed, pimpinella and star anise.

Eugenol, $C_{10}H_{12}O_2$, which occurs in oils of cloves, cinnamon, sassafras, canella and pimento.

Methoxychavicol, $C_{10}H_{12}O_2$, is found in dried betel leaves.

Safrol, $C_{10}H_{10}O_2$, occurs in oil of sassafras.

Carvol, $C_{10}H_{14}O$, in oils of dill and caraway.

Cinnamyl aldehyde and acetate, in oil of cinnamon. All these are well known bodies, their constitution has been determined, except carvol, about which there is some doubt.

Anethol is 1·4 methoxyallylbenzene.

Eugenol is 1·2·3· methoxyallylphenol.

Methoxychavicol is 1·2·4· methoxyallylphenol.

Safrol is eugenol $—H_2$ and contains a methylene group.

Carvol is keto-dihydrocymene, and is more nearly allied to the cymene group, with which, properly speaking, it should be placed.

Cinnamyl aldehyde and acetate, of course, are well known, and do not need to be described here.

The very close connection between anethol, eugenol and safrol is worthy of notice, as all are derivatives of methoxyallylbenzene, and bear a close relation to each other. With these I finish the second section of my paper, and though I have only skimmed over the surface of the subject, I trust I have not made any great omissions. To summarize—the constituents of most oils are terpenes of $(C_5H_8)_n$ mixed with the substance to which the odor is due, which may be alcohol, ketone, aldehyde, alkyl salt or phenol derivative. In many cases alkyl salts are present, and to them very often the odor is due, but it is to be hoped that a thorough investigation will be made into the constituents of the oils. Much has been done in this direction, notably by Semmler, and soon, I trust, our imperfect knowledge will be much extended.

A NEW METHOD FOR DETERMINING THE FATTY MATTER OF MILK.

By Leo Liebermann and S. Székely.

Fifty cc. milk at the temperature of the room are put in a glass cylinder about 25 cm. in height and about 4½ cm. internal diameter; there are added 5 cc. of potassa-lye at 1·27 specific gravity, closed with a well-fitting cork, and well shaken.

To this mixture are added 50 cc. of a light petroleum ether, the specific gravity of which is about 0·663, the boiling-point 60°, and which evaporates on the water-bath without residue. The glass is stoppered and again vigorously shaken so as to form an emulsion. To this emulsion are added 50 cc. alcohol of about 95·8 to 96 per cent., and the liquid is again well shaken. After at most four or five minutes the petroleum ether separates at the top, and the separation may be regarded as complete. We shake again three or four times, each time for a quarter of a minute, allowing each time the ether to separate out.

The petroleum ether will now have taken up all the fat. We ascertain this point by shaking up eleven specimens a different number of times, the first once and the eleventh eleven times. Already after the third or fourth shaking we have found quantities of fat which differ from each other only to an unimportant degree. After once shaking 3·535 per cent., after twice shaking 3·54 per cent., and the results which we obtained between the third and eleventh shaking fluctuated only between 3·55 and 3·56 per cent.

Of the stratum of petroleum ether, 20 cc. are drawn off with a pipette and introduced into a small tared capsule, the capacity of which is about 40 to 50 cc., and the neck of which is higher than 1 cm., with a diameter of 1½ to 2 cm. These small flasks are convenient, because the liquid does not readily rise out of them, and yet the evaporation goes on with sufficient rapidity. But of course small tared beakers or ordinary flasks may be used.

The flask is set upon a water-bath at a moderate heat, the petroleum ether is evaporated entirely away, and the residue is dried at from 110° to 120°, for which an hour is generally sufficient; the weight found, if multiplied by 5, gives the quantity of fat in 100 cc.

The quantities of fat obtained by the new method may be easily recalculated by the aid of the specific gravity into percentages by weight, so as to admit of a comparison with the Adams method, in which the milk is weighed. We remark that on the Adams method the extraction with petroleum ether must last for at least 3 hours.

The results of the new method vary from those of the gravimetric method by 0·066 in a positive direction, and by 0·037 per cent. in a negative direction. But these deviations, in our opinion, are not necessarily founded on the sources of error in the method, but are

chiefly due to the circumstance that in the gravimetric method the milk is weighed, whilst in the new method it is measured, and that the recalculation may occasion errors.—*Zeitschrift f. Anal. Chemie*, xxxv, p. 168, from Chem. News, 1893, 281.

ATTEMPT AT A GENERAL METHOD OF CHEMICAL SYNTHESIS.

By Raoul Pictet.

In order to develop from the totality of facts explained in my former papers a practical method of utilizing low temperatures in chemical syntheses, it will be useful to recall the partial laws which we have already seen.

The fundamental hypothesis which has guided us and the experimental verifications have enabled us to establish eight laws:

(1) At very low temperatures, below —130°, no chemical reaction takes place, whatever substances are present.

(2) All chemical reactions are manifested spontaneously at a certain temperature and under a certain pressure exerted upon the constituents; this is the temperature limit.

(3) The same reactions may be obtained below the temperature limit if we apply auxiliary energy by the use of electric currents or discharges.

(4) Exothermic reactions always present two phases: in the former we retain a control of the temperatures if we can remove from the combining bodies, by radiation as much heat as is produced at the same moment by the simultaneous effect of the affinities of the extraneous energies introduced into the substances. In the second phase, the temperature rises suddenly until the reaction takes place above the temperature limit.

The first phase is the reaction limit. The second phase is the reaction in mass.

(5) Endothermic reactions are always limit reactions.

(6) The dissociation of the products obtained by exothermic reactions corresponds to the laws of endothermic combinations and reciprocally.

(7) The temperature limit of chemical reactions is not in a known simple relation with the apparent energy of the phenomenon. On the contrary, the quantities of heat liberated seem to class the

ascending order of the temperature limit, especially in one and the same family of substances.

(8) The electric spark and current seem to be the best media for supplying extraneous energy to limited chemical reactions.

With these eight partial laws we may establish a complete scientific programme for the discovery of a general method of chemical synthesis.

We begin by bringing in contact the simple bodies, and defining experimentally the laws which govern their combinations, the relations between their temperatures, the pressures, and the quantities of heat to be supplied in limited reactions.

As this first series of observations must, on principle, give precise numerical values, we must never allow reactions in mass to interfere, as they disturb and modify the thermic conditions of the phenomenon. This condition, *sine qua non*, indicates at once the plan of operations to be followed. The chemist must have at command a powerful refrigeratory apparatus, by which he can at least reach temperatures of —130° to —150°, so as to paralyze all chemical reaction. Substances thus cooled are certainly below all the temperature limits.

The refrigerating tank must have a temperature which can be regulated at will from —130° to the ordinary temperature.

A powerful induction coil yields sparks which must be made to strike, by means of insulated conductors through the substances to be combined, in the refrigerated enclosure.

When the reaction commences, the heat produced each moment by the weight of the compounds obtained must be withdrawn by radiation, so that the temperature at which the reaction is produced may be kept constant.

The quantities of energy represented by the electric current in ampères and volts are equivalent to the endothermic phase of the reaction. The quantities of heat lost by radiation measure the exothermic phase.

The calorimetric measure effected in the refrigeratory enables us to know directly the effect of radiation for all the differences of temperature.

We shall on this principle constitute the first rational dynamic table in chemistry, by studying all the simple bodies, two by two, three by three, etc. By combining by the same methods, and with

the same appliances, the binary bodies with the simple bodies, we obtain the second dynamic table. Next we pass to the ternary substances, etc.

The successive experiments will discover the laws which govern the phenomena, and will in so far facilitate the knowledge of the utilization of the dynamic tables.

The line of the greatest chemical declination of all bodies will thus be determined experimentally.

Chemical reactions will be defined in a manner as precise and certain as the fall of a body on an inclined plane by a single track without ambiguity. We shall know beforehand, for any reaction which we may wish to produce, all the conditions to be fulfilled so as to obtain only a single effect, *e. g.*, the fixation of a new element upon a given primitive nucleus.

The track will be known and the result certain. Under this form we see the possibility of forming rationally by direct synthesis all the substances in nature.

It is probable that along with the electric spark we may utilize other sources of auxiliary energy, *e. g.*, the collateral chemical reactions produced in the series of substances studied, and which will yield a known number of calories. The subject of this immense research is scarcely touched upon; we have confined ourselves to lay down its principal lines.

The present experimental results give a preliminary sanction to this programme.

In concluding the exposition of these general views on the phenomena of ponderable matter, we see that the same equations of motion may represent as a simple function of distances:

(1) All astronomy and the phenomena of gravitation, the distance of bodies which attract each other, passing from infinity to distances where the action of the ether manifests itself to modify the law of Newton.

(2) All cohesion where the totality of the physical phenomena of changes of state linked to calorific phenomena where the distances of the attracting bodies pass from the limits of gravitation to the distance of bodies refrigerated to the absolute zero.

(3) All chemistry, phenomena of motion, when the distance of the attracting bodies is smaller than that observed at the absolute zero.

The equations of the movement of matter permit us thus to reduce these three sciences to a single formula, the numerical terms of which are not yet known, but from which we may logically deduce every observable phenomenon.—*Comptes Rendus*, cxvi, p. 1057, from Chem. News, 1893, 279.

CONVERSION OF ACONITINE INTO ISACONITINE.[1]

By Wyndham R. Dunstan, M.A., F.R.S., and Francis H. Carr.

From the Research Laboratory of the Pharmaceutical Society.

In a previous communication it has been shown that the roots of *Aconitum Napellus* contain, besides the highly poisonous aconitine, an almost non-poisonous isomeride isaconitine. The constitutional relationship of the two alkaloids is evidently an intimate one, since each alike furnishes the same hydrolytic products, viz: aconine and benzoic acid. The authors now show that when *aconitine hydrobromide* (m. p. 163°) is heated in aqueous solution it very gradually changes into the isomeric *isaconitine hydrobromide* (m. p. 282°). The change is facilitated by the presence of a small quantity (1–2 per cent.) of free hydrobromic acid, but is not assisted if sufficient is present to induce hydrolysis of a large proportion of aconitine.

The isaconitine was identified not only by the high melting point of its salt, but also by the formation and analysis of the characteristic auchlorisaconitine. No similar change could be detected in *aconitine nitrate* when this salt is heated either in neutral or acid solution, neither could the conversion be effected by heating aconitine with glacial acetic acid, although in this case anhydro-aconitine is produced if the heating is continued for eighteen hours at 120°. Dissolution of aconitine in concentrated sulphuric acid fails to convert it into isaconitine, even after gently heating, and aconitine sulphate does not appear to undergo any conversion when it is heated for many hours in contact with very dilute sulphuric acid. No isaconitine seems to be produced during the hydrolysis of aconitine by cold soda solution. The authors are making further experiments in the hope of gaining information with regard to the mechanism of the conversion of aconitine hydrobromide into isaconitine hydrobromide.

[1] The substance of a communication made to the Chemical Society on June 15. Reprinted from Pharm. Jour. Trans., June 24, 1893, p. 1045.

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

The Kansas State Pharmaceutical Association met in its fourth annual meeting at Wichita, May 23. A large number of papers were read, among them the following: Percentage of moisture and extractive in crude drugs, by D. C. Liemance; estimation of colchicum preparations, by E. F. Walleck; drug and plant analysis, and insects injurious to drugs, by L. E. Sayre; aseptol, by L. H. Bergman; and the quality and coloring power of commercial pigments, by M. Noll. The officers for the ensuing year are: F. W. Atkins, Girard, president; Mrs. M. O. Miner, Hiawatha, secretary; H. W. Spangler, Perry, treasurer. The next annual meeting will take place at Salina.

The Kentucky Pharmaceutical Association was called to order by President Geier on May 23, in Louisville, Ky., where it was convened in its sixteenth annual meeting. The first session was taken up with addresses of welcome, president's address, and committee reports; and was followed by the reading of papers and election of officers, which resulted as follows: President, Robt. J. Snyder, Louisville; secretary, J. W. Gayle, Frankfort; treasurer, Wm. Morris, Paris. The Association will meet again in May, 1894, in Paris; the local secretary being C. J. Clark.

The Louisiana Pharmaceutical Association was called to order May 2, by president L. F. Chalin, in New Orleans. Besides the president's address and the various committee reports, the association listened to an interesting paper on "Deterioration of Drugs" by J. H. Storck. The newly elected officers are: President, P. A. Capdeau; corresponding secretary, J. A. Legendre; recording secretary, Mrs. E. Rudolph, and treasurer, E. Lalmant, all of New Orleans.

The Minnesota State Pharmaceutical Association met in its ninth annual meeting at Hotel St. Louis, Lake Minnetonka, June 13 and 14, President C. R. J. Kellam in the chair, who in his annual address expressed his views of pharmaceutical legislation in the State. Various reports and papers were submitted, among which latter, was one by F. J. Wulling on the pharmacal profession, and two by L. A. Harding, on "the relation of chemistry to pharmacy" and "glycerin suppositories." The officers for the ensuing year are J. E. Stiles, president, and Chas. T. Heller, secretary and treasurer. The next meeting place will be Lake Minnetonka and the date June 12–13, 1894.

The Mississippi Pharmaceutical Association, at its annual convention in Jackson, May 9, discussed various topics bearing on Pharmaceutical legislation, and after their routine business was disposed of, elected the following officers: H. F. West, president; Carson Lemly, secretary, and O. Lillybeck, treasurer. The next meeting will take place in Jackson, in May, 1894.

The New Jersey Pharmaceutical Association convened in Atlantic City on May 24, and listened to various addresses, in addition to the regular routine. The following officers were elected: E. B. Jones, Mount Holly, president; W. C. Alpers, Bayonne, secretary, and Wm. M. Townley, Newark, treasurer.

The Pennsylvania Pharmaceutical Association held its 16th annual meetnig, June 13–15 at Eureka Springs, Saegertown (near Meadville).

The place chosen was a delightful one upon the banks of French creek, and the

hotel accommodations were excellent. The number present was less than usual, owing to the World's Fair, and the distance from the central and eastern portions of the state, but the number of new members taken in (40) was greater than for several years. The officers elected to serve the ensuing year are William McIntyre, Philadelphia, President; Dr. W. H. Reed, Norristown, 1st Vice-President; H. C. Murto, Pittsburg, 2d Vice-President; Jos. L. Lemberger, Lebanon, Treasurer; Dr. J. A. Miller, Harrisburg, Secretary; W. S. Seabold, Annville; Wm. Sweely, Williamsport, and A. H. Durham, Reading, Executive Committee.

The committee on legislation reported that they had been successful in their endeavor to have the section of the pharmacy law repealed which allowed physicians to register without undergoing an examination.

Among the papers read was one on *syrup of cimicifuga*, by S. W. Heinitsh, in which the author gives the following formula for this syrup, as being easily prepared, pleasant and desirable:

Powdered Cimicifuga (No. 60), ℥iv Troy.
Diluted alcohol, q. s.
Carb. magnesia, ℥ij Troy.
Sugar (granulated), ℥xiv Troy.
Water, q. s. ft. f℥xvi.

Exhaust the powder with diluted alcohol, evaporate the tincture to 8 fl. oz., triturate with the magnesia, filter and dissolve the sugar in the filtrate without heat.

The manufacture of linseed oil, by various processes, was explained in a paper by Dr. Reed. The bisulphide of carbon method is as follows: The seed is crushed, packed in percolators, and the solvent poured upon it. The menstruum dissolves the oil and the solution is caught below in proper receptacles. The solvent is reclaimed by distillation and condensation, and the oil remains behind. By this process the seed is thoroughly exhausted, but the disadvantages are the inflammable nature of the menstruum, the odor imparted by it to the oil, and the odor and taste of the cakemeal, which impairs its market value.

The old method of expression is as follows: The seeds are crushed between two large stones, weighing over two tons each, in an old style chaser mill. By this means it is difficult to crush all the seeds at the first grinding, so the cake is subsequently reground. The meal, under constant stirring, is now warmed over a specially constructed furnace, it is then placed in press bags, knit of heavy woollen yarn, folded within a leather book and pressed in what is known as a wedge press, allowing the mass to remain squeezed for a short while. The cake is then removed, reground, and a second pressing removes all or nearly all the oil from the mass. The oil from the drip pans is then emptied into a large tank and allowed to settle. The yield of oil is about 17 pints to a bushel of seed, or about 28 per cent. by weight. In the more improved method, by expression, the seed is ground in roller mills driven by steam power. It is fed to the rolls automatically and crushed fine, then collected, transferred to steam "jacket pans," and under constant stirring heated to 200° F. The heated crushed seed is now placed in camel's hair pockets or jackets having the shape of a good sized towel, placed on a specially constructed

table and smoothed evenly throughout. The jackets are now laid on the press bed and hydraulic pressure of 4,000–6,000 lbs. to the square inch applied. The yield of oil is about 18 pints from a bushel of seed, but if heating the ground seed be omitted, not more than half the usual percentage will be secured.

On Wednesday evening a concert was given by the principal and pupils of the Meadville Conservatory of Music, followed by various other entertaining and amusing features. On Thursday afternoon, the druggists of Meadville tendered the association an excursion on Lake Conneaut, and a banquet at the Lake House.

The next meeting of the association will be held at the Neversink Mountain House, Reading, Pa., on the second Tuesday of June, 1894.

The Tennessee Druggists' Association met in Nashville, May 16. The three sessions held were taken up with addresses, the presentation of various reports and the reading of papers, among which was one by Prof. Ruddiman, on the testing of medicines by the retailer. The officers for the ensuing year are: J. O. Burge, Nashville, president; Will Vickers, Murfreesboro, secretary; and J. F Voight, Chattanooga, treasurer. The next meeting will be held in Chattanooga, May 28, 1894.

The Texas Pharmaceutical Association met in fourteenth annual convention at the Oak Bluff Opera House, Dallas, May 9. Ex-Mayor Frank Oliver welcomed the Association, and President Burgheim, in his annual address, spoke of the "Necessity of our Union." At the second day's session, reports were received, papers read and the following new officers elected: President, L. Myers Connor, Dallas; secretary, Geo. Heyer, Houston, and treasurer, W. F. Shook, Dallas. Next year the association will meet at Austin, on the second Tuesday of May.

The Utah Pharmaceutical Association, which met in convention at Ogden, May 9, was called to order by President Farlow. The visitors were welcomed by Dr. F. B. Hurlbut, and after the president's address, various reports were received, and a resolution, affecting registration without examination, was adopted. Several papers were read, and it was decided to hold the next annual meeting in Provo, on the second Tuesday in June, 1894; Herbert Pyne was elected local secretary. S. P. Ash, Ogden, was elected president; secretary C. H. McCoy was re-elected, and the newly chosen treasurer is H. A. Walker, Ogden.

The Washington State Pharmaceutical Association was called to order May 8, at Spokane, president A. W. Stewart in the chair. After the address of welcome by R. Easson and the response thereto by S. O. Harmon, the president delivered his annual address. Beside the routine business, various reports were submitted, and the officers elected are: A. M. Doland, Spokane, president; Walter St. John, Tacoma, secretary; James Lee, Seattle, treasurer. The next meeting will take place at Tacoma, on the third Monday of May, 1894.

The Massachusetts College of Pharmacy held its annual graduation exercises on Wednesday evening, May 24, 1893, in Association Hall of the Y. M. C. A. building. The degree was conferred upon twenty-five graduates.

The National College of Pharmacy held its commencement exercises on Wednesday evening, May 10, in Metzerott's Music Hall, Washington, D. C. The graduates, ten in number, were addressed by the Rev. A. G. Rogers.

The Louisville College of Pharmacy held its commencement exercises on Tuesday afternoon, July 11, 1893, in Harris Theatre, Louisville, Ky. The degree of Ph.G. was conferred on fourteen graduates.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

A Practical Treatise on Materia Medica and Therapeutics, with Especial Reference to the Clinical Application of Drugs. By John V. Shoemaker, A.M., M.D., Professor of Materia Medica, Pharmacology, Therapeutics, and Clinical Medicine, and Clinical Professor of Diseases of the Skin in the Medico-Chirurgical College of Philadelphia, etc. Second Edition. Revised. In two royal octavo volumes. Volume I, 353 pages; devoted to Pharmacy, General Pharmacology, and Therapeutics and Remedial Agents not Properly Classed with Drugs. Volume II, 680 pages: An Independent Volume upon Drugs. Volume I, in Cloth, $2.50 net; Sheep, $3.25 net. Volume II, in Cloth, $3.50 net; Sheep, $4.50, net. Philadelphia: The F. A. Davis Company, Publishers.

The first volume is divided into two parts of which the first is entitled "Pharmaceutical Remedies or Drugs," and contains information on the Pharmacopœia, its nomenclature, classes of preparations, etc.; on pharmaceutical manipulations; on prescription-writing; a syllabus on poisons and their antidotes, and an exposition on the classification of medicines. Part II treats of those remedies and expedients in medicines, which are not classed with drugs or pharmaceutical preparations, such as electricity, massage, heat, cold, diet, etc. The scope and arrangement of the second volume of this work has been fully described in our volume for 1891 (p. 320). In the second edition, now before us, the introductory portion, relating to the classification of medicines, has been omitted, since this properly belongs to, and is contained in, the first volume. The drugs and chemicals, as heretofore, are considered in alphabetical order. Some of the articles, like antipyrin and tuberculin, have been entirely rewritten. New articles have been added, like phenocoll, thallin and xanthium; but most of the new articles, including most of the synthetical remedies, have found a place in the appendix, to which also some drugs have been removed, which were formerly in the general list, like apocynum, areca, bryony and vanilla.

The work has been written and revised by a physician for the use of physicians, who will find it of much service and to be readily consulted, each volume being provided with a general index and a clinical index, all bearing evidence of the care bestowed upon their preparation.

On the Prevention of Blindness. Addressed to physicians, nurses and midwives.

Circular 35 of the Pennsylvania State Board of Health treats of ophthalmia of the new born, and the means to prevent it. The circulars may be obtained by application to the Secretary of the Board, 1532 Pine Street, Philadelphia, enclosing a 2 cents (or for the entire series 4 cts.) postage stamp.

Surgical Dressings, aseptic and antiseptic. By Seward W. Williams, Ph.C., F.C.S. Pp. 23.

A reprint from the Pharmaceutical Record, April 6, 1893.

Proceedings of the Utah Pharmaceutical Association, at the first meetings held April 6 and Oct. 4, 1892, in Salt Lake City. Pp. 54.

On p. 387, of our last volume, we reported the organization of this Association; at the adjourned meeting trade matters furnished the subjects for discussion.

American Orthopedic Association. Address of the president, Benj. Lee, M.D., Philadelphia. Pp. 8.

The address is chiefly devoted to inflammation of cartilage.

Diet for the Sick. By Miss E. Hibbard, Principal of Nurses Training School, Grace Hospital, Detroit, and Mrs. Emma Drant, Matron of Michigan College of Medicine Hospital, Detroit, to which has been added Complete Diet Tables for various diseases and conditions, as given by the highest authorities. Detroit, Mich., The Illustrated Medical Journal Co., publishers. Paper, 81 pages. Price, postpaid, 25 cents; 6 for $1.00.

This little book is intended to give instructions for the preparation of food for the sick; and indicates also the kind of diet recommended or prohibited by certain prominent physicians in various diseases. The instructions are plain and easily carried out and the receipts appear to be practical.

OBITUARY.

Dr. David Hunter, Ph.G., Class 1874, died at his late residence, No. 141 N. 20th St., June 16, 1893, of pleuro-pneumonia.

He was in business at Atlantic City at one time and later on at 38th and Aspen Sts., but at the time of his decease was practising his profession. He was a brother of Dr. Thomas Hunter, Ph.G., of 15th and Wharton Sts.

Edmund Pollitt, Ph.G., Class 1848, died at his late residence, No. 2017 N. 8th St., of apoplexy, July 1, 1893; was found dead in his bed. He was in business for a number of years at Front and Christian Sts., this city, after which he was with Wm. Snowden, 4th and Noble, until his death, but during the last 9 or 10 years and at the time of his death was assisting Mr. David S. Ferguson, 2200 Frankford Ave.